UNION SWITCH & SIGNAL

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PN-250CG
Code Generator

US&S Part No.	
N40105601	N40105611
N40105602	N40105612
N40105603	N40105613
N40105604	N40105614
N40105605	N40105616
N40105606	N40105617
N40105607	N40105618
N40105608	N40105619
N40105609	N40105620
N40105610	N40105621
	N40105622

♦ **Installation**

♦ **Operation**

♦ **Maintenance**

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Rev 1
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We expressly disclaim liability resulting from any improper handling or use of our equipment, even if these instructions contain no specific indication in this respect. We strongly recommend that only approved US&S spare parts be used as replacements.

Revision History

Rev.	Date	Nature of Revision
Original	January 2000	Original Issue
1	July 2006	Incorporated ECO CRS-1407A; changed operating voltage in Section 1.3 from 8V to 9V.

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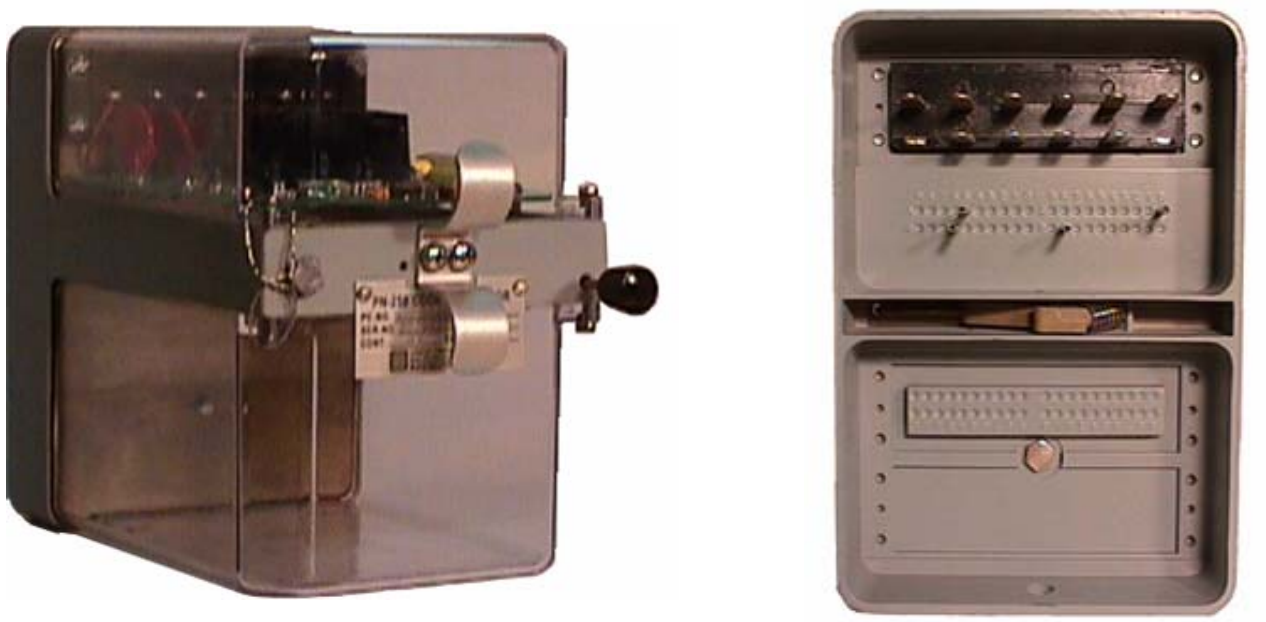
1 General Information

1.1 Introduction

This service manual provides description and installation information for Union Switch & Signal's PN-250CG (Code Generator) (Figure 1-1). This relay is a solid state direct replacement for the mechanical code generator PC-250 TR. Model numbers are determined by the nominal code rate and operating voltage of the PN-250CG as outlined in Table 1-1.

1.2 Description

The PN-250CG is a direct replacement for the mechanical code generator PN-250 TR. Operation of a mechanical code transmitter is based on a pendulum, which has a natural frequency of oscillation. Motion is sustained by an electromagnetic circuit, which alternately attracts the pendulum in opposite directions. The pendulum alternately closes and opens opposing sets of contacts. In the neutral position of the pendulum, which also corresponds to its position with no voltage applied to the coil, neither set of contacts are closed. For nearly one-half of the pendulum's motion, one set of contacts is closed and for the opposing range of motion a second set of contacts is closed. Available nominal code rates are 0, 75, 120, and 180 Codes Per Minute (CPM). Since the contacts are arranged as "break before make," both sets are alternately closed for less than 50% of the oscillation period. It is this fundamental operation that is duplicated electronically by the PN-250CG.



Front **Back**

Figure 1-1 - PN-250CG Code Generator Relay

In the PN -250 Code Generator, an oscillator circuit replaces the mechanical pendulum. Two separate comparator circuits control the turn on and turn off of solid state switching devices, which replace the Front and Back contacts of the mechanical relay. Light Emitting Diodes (LEDs) in the output circuit provide an indication when the Front (yellow LED) and Back (green LED) outputs are energized to provide a conduction path between the Front and Heel (or Back and Heel) terminals. Refer to the block diagram in Figure 1-2 and the output pin location diagram, Figure 1-3, for additional information.

Different types of output switching devices are provided to replace the low voltage and high voltage contacts of the mechanical relay. Unlike the mechanical counterpart however, the high voltage output version of the PN-250CG is relegated to switching AC only, as it uses Triacs in the output circuit. The low voltage outputs switch AC or DC sources through a network of Field Effect Transistors (FET) devices.

Table 1-1 lists several standard relays by code rate and output switch type; other versions are available.

To ensure that units of different code rates or output rating are not interchanged, index plates for the PN-250 base are provided with the relay to mount on a base to match a set of keying holes in the index plate to keying pins on the relay. Table 1-2 lists the part numbers and keying for those Code Generator Relays which are interchangeable with certain existing US&S mechanical PC-250 TR Code Relays.

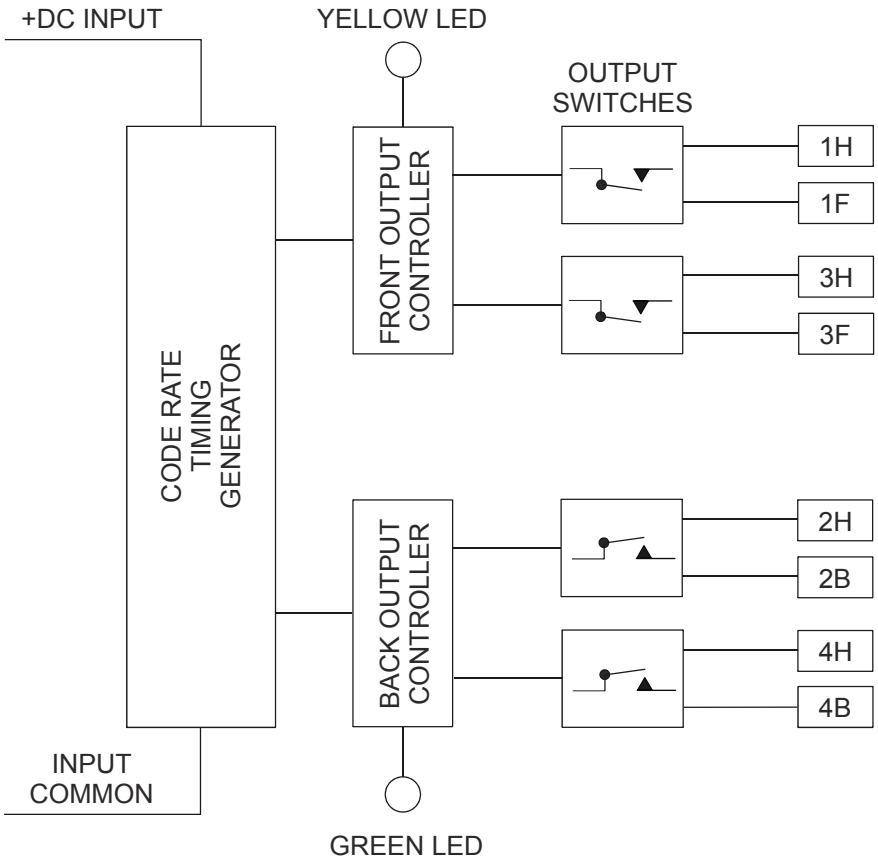
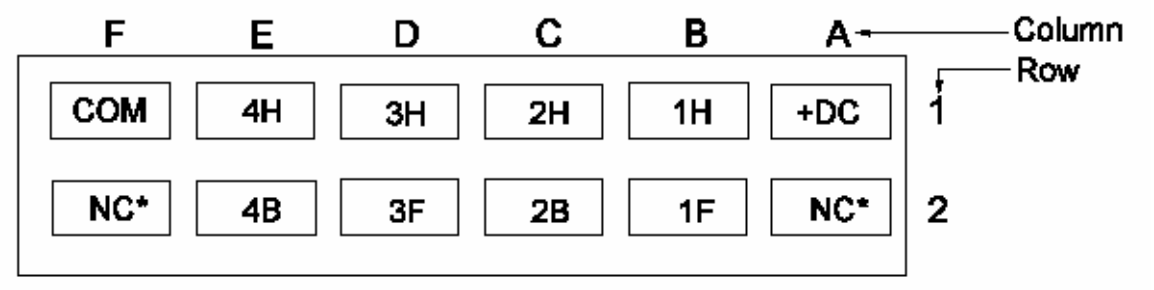


Figure 1-2 - PN-250CG Block Diagram



Rear View

Notes:

*** NC = No Connection**

+DC = +DC Input

COM = Input Common

Figure 1-3 - Contact Location, Top Rear of PN-250CG Case

1.3 Specifications

Input (coil) Operating Range: 9 to 16 VDC Reverse voltage protected.

Current Draw: 80 Millamperes, max.

Output Switch Ratings: Low Voltage AC or DC 2.5 amperes, 32 VDC Max.* or 22 Vrms AC Max., ON resistance 0.5 ohm (short circuit protected).

High Voltage 4 amperes 150 Vrms Max.* AC only. The voltage drop is 1.25 Vrms across an ON switch and is independent of load current (an external 6 ampere fuse is required for short circuit protection).

* *Maximum voltage is determined by a transorb to protect DC switches from excessive voltage spikes when operating code following relays; for the AC version a 150 VRMS MOV is similarily used anticipating 120 VRMS as the source voltage.*

Number of Output Switches: Four total - arranged as two fronts and two backs. Each with separate heel connections. (Refer to Figure 1-2 and Figure 1-3.)

Indications: Alternately flashing yellow and green LEDs. The yellow LED indicates that the front outputs are active (closed); the green LED indicates that the back outputs are active (closed).

Temperature Range: -40°C to +70°C, 0 to 95% relative humidity non condensing.

Dielectric strength: 2000 Vrms between all external isolated connections and case except across open switches which are limited by Transorb or MOV protection.

Table 1-1 - PN-250CG Code Specifications

Model No.	Nominal Code Rate	Tolerance	ON Time Percentage	Switch Rating	Part No.
PN-250-CG 50 AC	50	45.6 - 50.4	46% - 48%	HV	N40105617
PN-250-CG 50 DC	50	45.6 - 50.4	46% - 48%	LV	N40105621
PN-250-CG 75-XX	75	68.4 - 75.6	45% - 47%	LV	N40105602
PN-250-CG 75 XX	75	68.4 - 75.6	45% - 47%	HV/LV	N40105605
PN-250-CG 75 AC	75	68.4 - 75.6	45% - 47%	HV	N40105608
PN-250-CG 75 AC	75	68.4 - 75.6	45% - 47%	HV	N40105612
PN-250-CG 75 XX	75	68.4 - 75.6	45% - 47%	LV	N40105618
PN-250-CG 120 DC	120	117 - 129	44% - 46%	LV	N40105603
PN-250-CG 120 XX	120	117 - 129	44% - 46%	HV/LV	N40105606
PN-250-CG 120 AC	120	117 - 129	44% - 46%	HV	N40105611
PN-250-CG 120 AC	120	117 - 129	44% - 46%	HV	N40105613
PN-250-CG 180 DC	180	175.4 - 193.2	42% - 44%	LV	N40105601
PN-250-CG 180 XX	180	175.4 - 193.2	42% - 44%	HV/LV	N40105604
PN-250-CG 180 XX	180	175.4 - 193.2	42% - 44%	HV	N40105607
PN-250-CG 180 AC	180	175.4 - 193.2	42% - 44%	HV	N40105614
PN-250-CG 275 XX	275	268.8 – 283.2	40% - 42%	LV	N40105609
PN-250-CG 275 XX	275	268.8 – 283.2	40% - 42%	HV	N40105610
PN-250-CG 275 XX	275	268.8 – 283.2	40% - 42%	HV/LV	N40105619
PN-250-CG 420 XX	420	413.4 – 425.4	38% - 40%	HV	N40105616
PN-250-CG 420 XX	420	413.4 – 425.4	38% - 40%	HV/LV	N40105620
PN-250-CG 420 AC	420	413.4 – 425.4	38% - 40%	LV	N40105622

Table 1-2 - PN-250CG Cross Reference and Indexing

PC-250 TR Part No.	PN-250CG Part No.	Indexing
N322556-001	N40105601	5, 6, 0, 1
N322556-002	N40105602	5, 6, 0, 2
N322556-003	N40105603	5, 6, 0, 3
N322556-004	N40105604	5, 6, 0, 4
N322556-005	N40105605	5, 6, 0, 5
N322556-006	N40105606	5, 6, 0, 6
N322556-007	N40105607	5, 6, 0, 7
N322556-008	N40105608	5, 6, 0, 8
N322556-009	N40105609	5, 6, 0, 9
N322556-010	N40105610	5, 6, 1, 0
N322556-011	N40105611	5, 6, 1, 1
N322556-012	N40105612	5, 6, 1, 2
N322556-013	N40105613	5, 6, 1, 3
N322556-014	N40105614	5, 6, 1, 4
N322556-016	N40105616	5, 6, 1, 6
N322556-017	N40105617	5, 6, 1, 7
N322556-018	N40105618	5, 6, 1, 8
N322556-019	N40105619	5, 6, 1, 9
N322556-020	N40105620	5, 6, 2, 0
N322556-021	N40105621	5, 6, 2, 1
N322556-022	N40105622	5, 6, 2, 2

2 Installation and Operation

2.1 Replacement Installation Procedure (Figure 1-1 and Figure 2-1)

1. The PN-250CG directly replaces the US&S mechanical code generator PC-250 TR in the existing base. No wiring or circuitry changes are required.

2. Ensure that the correct PN-250CG model is available for installation. Verify that the drilling of the index plate is correct for the code rate and model type (AC or DC). See Section 1.2 and Table 1-1 for code rates and power options and Figure 1-2 and Table 1-2 for index patterns.

WARNING

Never drill new holes in a base indexing plate which will permit application of relays with different part number or change indexing pins on the back of a relay unless it is being converted to a new part number. Otherwise, safe functioning of the circuit in which the relay is used may be compromised.

3. Remove the old relay.

4. Orient the PN-250CG to the existing base, with the name plate right side up. Plug the relay into the base. The relay should be pushed firmly against the mounting base while depressing the latch rod. After the relay is completely seated in the base, release the latch rod and pull on the handle to ensure that the relay has locked into place.

2.2 New Installation

1. Secure the mounting base (N438689-003) directly to the rack using the hardware furnished with the mounting kit. Ensure that base wiring is in accordance with wiring diagram for the specific job. General wiring guidelines are as follows:

   a. The new one-piece mounting base with hardware includes a full complement of receptacle contact springs (M451142-2702) to accomodate one or two #14 - #16 wires, mounting fasteners and tags. It can, however, be equipped with receptacle contact springs for one or two #10 - #12 wires (M451142-2703) or for one or two #18 - #20 wires (M451142-2701). Make certain which type of solderless receptacle contact springs accompany the mounting base before proceeding with their installation.

   b. Each solderless receptacle contact spring should be inspected for physical damage before proceeding with installation. Replace defective springs.

   c. Receptacle contact springs must be inserted into the base with the lock side down.

d. Install wires in the receptacle contact springs in accordance with approved wiring diagrams. Use the correct crimping tool for the wire to be installed (see Table 2-1).

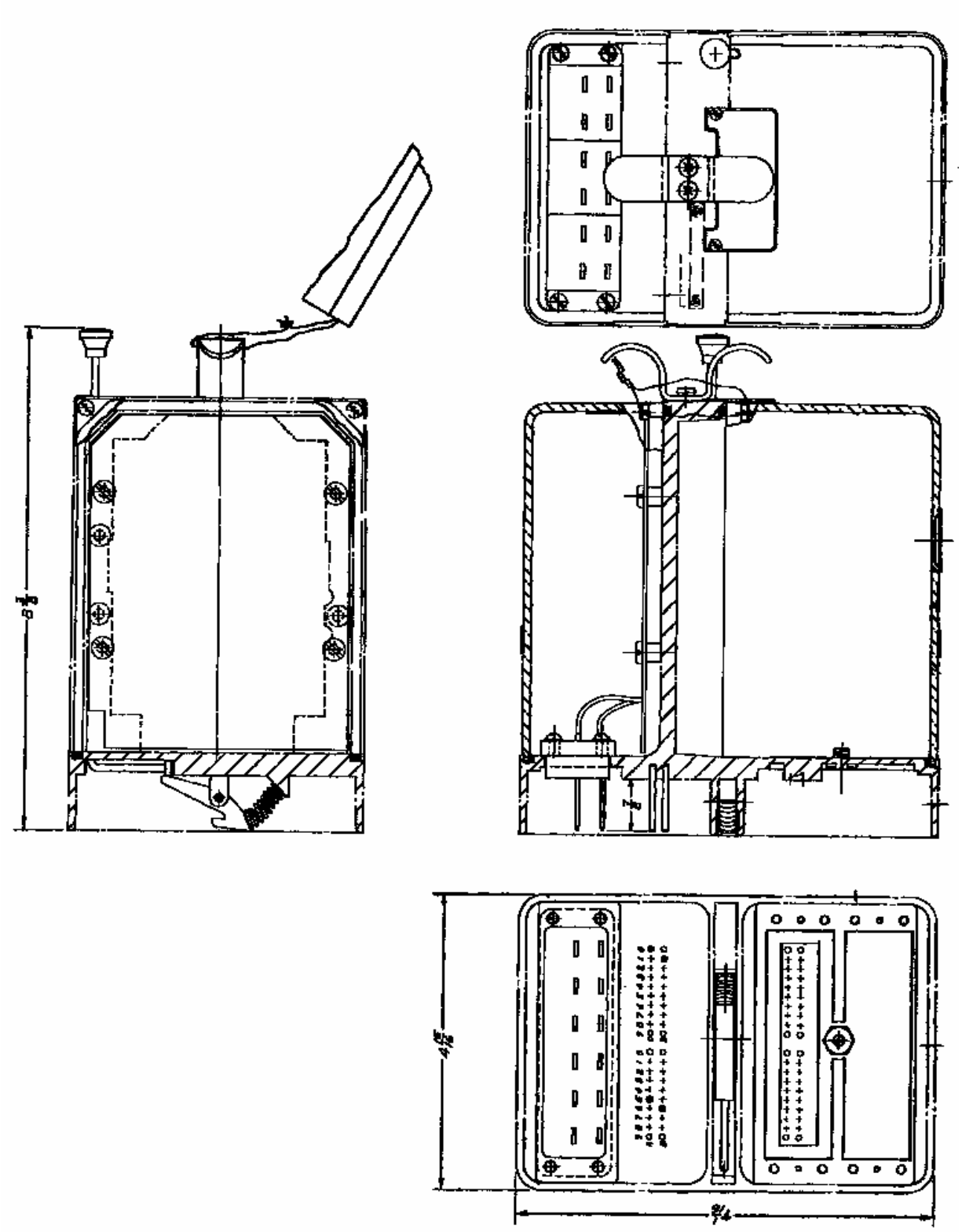


Figure 2-1 - PN-250CG Basic Package Size

Table 2-1 - Crimping Tools

Crimping Tool Amp Type	Wire Size	Receptacle Contact Spring
J397138	#10/#12 AWG	M451142-2703
J397139	#14/#16 AWG	M451142-2702
J397188	#18/#20 AWG	M451142-2701

1) Strip 3/16” of insulation from the end of the wire.

2) Place the receptacle contact spring into the jaws of the proper crimping tool.

3) Partially close the crimping tool jaws against the receptacle contact spring to hold it in place. Do not crush the receptacle contact spring barrel at this time.

4) Insert the stripped end of the wire all the way into the receptacle contact spring barrel. Squeeze the tool handle until crimping is completed and the jaws release. Always attach the first wire to the longest terminal. This ensures that a second lead may be attached to the receptacle contact spring at a later time.

5) Remove the crimped receptacle contact spring from the tool and inspect the connection. Make certain that the wire is flush with the crimped barrel and that there are no loose strands of wire.

6) After insertion, pull firmly on the wire to make sure the receptacle contact spring is locked in the cavity.

2. Orient the PN-250CG to the base, with the name plate right side up. Plug the relay into the base. The relay should be pushed firmly against the mounting base while depressing the latch rod. After the relay is completely seated in the base, release the latch rod and pull on the handle to ensure that the relay has locked into place.

2.3 Verify Operation

1. Verify that the newly installed PN-250CG is operating by observing that the two LED indicators are blinking in an alternating fashion.

2. Verify that the overall system, of which the PN-250CG is a part, is functioning properly.

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3 Maintenance and Periodic Inspection

1. The PN-250CG is a maintenance-free unit. There are no FRA requirements for periodic checking of solid state code transmitter units. Periodic verification of PN-250CG code rate operation is at the customer's discretion.

2. Malfunctioning PN-250CG units should be returned to Union Switch & Signal for repair.

4 RAIL Team and Technical Support

The Rapid Action Information Link (RAIL) Team is comprised of a group of experienced product and application engineers ready to assist and resolve any technical issues concerning any US&S product.

Any questions regarding the contents of this Service Manual can be answered by contacting the RAIL Team toll-free at 1-800-652-7276 or via the Internet at: railteam@switch.com.

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